

Checklist of aquatic Diptera (Insecta) of Plitvice Lakes National Park, Croatia, a UNESCO world heritage site

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Academic editor: T. Dikow | Received 24 December 2019 | Accepted 10 February 2020 | Published 12 March 2020

<http://zoobank.org/A8ACA00F-1AEF-41C4-AE0E-402C3E5A6A7B>

Citation: Ivković M, Dorić V, Baranov V, Mihaljević Z, Kolcsár L-P, Kvifte GM, Nerudová J, Pont AC (2020) Checklist of aquatic Diptera (Insecta) of Plitvice Lakes National Park, Croatia, a UNESCO world heritage site. ZooKeys 918: 99–142. <https://doi.org/10.3897/zookeys.918.49648>

Abstract

Studies on aquatic Diptera in the Plitvice Lakes National Park (Croatia) conducted in the last 50 years have produced 157 species and 7 taxa of aquatic Diptera placed in 13 families. Samples were collected at 25 sampling sites representing the four main types of karst aquatic habitats: spring, stream, tufa barriers and lakes. All records of all the aquatic families of Diptera in Plitvice Lakes NP are summarized, including previously unpublished data. Twelve species new for Plitvice Lakes NP are recorded for the first time, belonging to the families: Chironomidae – *Labrundinia longipalpis* (Goetghebuer, 1921), *Nilothauma brayi* (Goetghebuer, 1921), *Potthastia longimanus* Kieffer, 1922, *Polypedilum* (*Polypedilum*) *nubeculosum* (Meigen, 1804), *Tanytarsus brundini* Lindeberg, 1963; Dixidae – *Dixella autumnalis* (Meigen, 1838); Scathophagidae – *Acanthocnema latipennis* Becker, 1894 and Stratiomyidae – *Oxycera pardalina* Meigen, 1822, *Oxycera limbata* Loew, 1862, *Oxycera turcica* Ustuner & Hasbenli, 2004, *Nemotelus pantherinus* (Linnaeus, 1758), *Oplodontha viridula* (Fabricius, 1775). The most species-rich family was the Chironomidae with 62 species (and an additional seven taxa), followed by the Empididae with 22 species and

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Limoniidae with 19 species. The highest number of species was recorded in springs. The relatively low number of species in certain families and the complete absence of some aquatic families shows that further research into the aquatic Diptera in Plitvice Lakes NP is needed.

Keywords

Barrage lake system, Chironomidae, Empididae, Limoniidae, new records, *Oxycera* spp.

Introduction

Most people probably know true flies (Diptera) mainly as a nuisance and as disease-carrying blood-sucking insects, but Diptera are also key players in the recycling of organic material in ecosystems, from the sewage of our urban communities to the leaf litter of the forest floor. In addition, Diptera provide other general ecosystem services such as pollination and pest control, but are also vectors of disease as terrestrial adults (Pape 2009; Marshall 2012; Adler and Courtney 2019).

More than any other group of macro-organisms, Diptera dominate the freshwater environment and are the most numerous group in terms of described species in freshwaters. Nearly one-third of all described fly species, roughly 46,000 species, have some connection with an aquatic environment during development process (Adler and Courtney 2019). Their abundance, omnipresence, and diversity of adaptations to the aquatic environment, position them as major drivers of ecosystem processes (Hölker et al. 2015). Fly larvae are well represented as ecosystem engineers and keystone species that alter the abiotic and biotic environments through activities such as burrowing, grazing, suspension feeding, and predation (Wotton et al. 1998; Adler and Courtney 2019). The enormous populations sometimes achieved by aquatic flies can provide the sole or major dietary component for other organisms, and as both predators and herbivores, they can serve as biological control agents (Collins and Blackwell 2000; Werner and Pont 2003; Adler and Courtney 2019). They serve as indicators of historical and future ecological and climate change while at the same time they have played a role as indicators of water quality from the earliest years of bioassessment (Walker 1987; Mihaljević et al. 1998; Larocque et al. 2001; Adler and Courtney 2019).

As holometabolous insects that undergo complete metamorphosis, all aquatic Diptera have a life cycle that includes a series of distinct stages or instars. A typical life cycle consists of a brief egg stage (usually a few days or weeks, but sometimes much longer), three or four larval instars (usually three in Brachycera, four in lower Diptera, and more in Simuliidae, Tabanidae, Thaumaleidae, some Chironomidae, and a few others), a pupal stage of varying length, and an adult stage lasting from less than two hours (Deuterophlebiidae) to several weeks or even months (Courtney et al. 2017; Lackmann and Butler 2018; Adler and Courtney 2019).

From all types of aquatic habitats, including tree holes to open oceans, and glacial meltwaters to hot springs, Diptera are the true conquerors of the aquatic environment. They have been found at elevations up to 5600 m in the Himalayas and at depths of

more than 1000 m in Lake Baikal. Furthermore, the presence of Diptera species in mainland Antarctica (e.g., *Belgica antarctica* Jacobs, 1900) makes them the only group of insects inhabiting all of the world's continents (Allegrucci et al. 2006; Ferrington et al. 2008; Adler and Courtney 2019). Aquatic Diptera are free-living insects that require a wet environment in at least one life stage (Adler and Courtney 2019) or, more strictly, aquatic Diptera are considered as those associated with water bodies (Courtney et al. 2017). Out of 158 dipteran families worldwide, 41 have aquatic representatives (Adler and Courtney 2019), and in Europe there are 130 dipteran families of which about 25 are related to aquatic habitats (Oosterbroek 2006).

Plitvice Lakes form the oldest National Park in the Balkan region and is probably one of the most famous National Parks in Europe because of its exquisite beauty. Plitvice Lakes NP was established as a National Park in 1949, and from 1979 Plitvice lakes NP has been a UNESCO world natural heritage site (Stilinović and Božičević 1998). Its importance is not only scientific, as a unique karstic phenomenon, but also as a place of huge economic importance for the local community as more than a million people per year come to visit it.

Materials and methods

Study site

Plitvice Lakes National Park (NP) is a 295 km² forest reserve located in the karst region of the Dinaric Mountains in Croatia. The Plitvice Lakes barrage lake system consists of 16 oligotrophic, dimictic and fluvial lakes divided by tufa barriers that form an approximately 8.2 km long barrage system. The lakes are characterised by a low organic solute concentration, supersaturation with calcium salts, pH > 8.0, and the presence of algae and mosses mediating tufa barriers formation (Srdoč et al. 1985; Stilinović and Božičević 1998). After the confluence of the Bijela rijeka and Crna rijeka Rivers, they form the Matica River which is the main surface-water supplier of the lakes (Stilinović and Božičević 1998). According to the Köppen climate classification, this area is influenced by temperate and boreal climates (Šegota and Filipčić 2003).

Specimen records

This paper is based on unpublished data from our own research and on published data gleaned from the literature. Each record was georeferenced using ArcGIS software. The names of taxa presented in this checklist reflect current nomenclature and classifications (Yang et al. 2007; Ashe and O'Connor 2009, 2012; Pape and Beuk 2012; Adler and Crosskey 2018; Ivković et al. 2019; Oosterbroek 2019; Starý 2019). Locality records are listed for each species. A list of locality names including latitude, longitude, altitude, and number code for each locality is given in Table 1, and a map with all sites

Table 1. Sampling sites in National Park Plitvice Lakes, Croatia.

| Site Name | Site ID | Latitude / Longitude | Elevation (m) |
|---|---------|------------------------|---------------|
| Spring of Bijela rijeka, Plitvice Lakes NP | 1 | 44°49'58"N, 15°33'25"E | 720 |
| Upper reach of Bijela rijeka, Plitvice Lakes NP | 2 | 44°50'04"N, 15°33'33"E | 715 |
| Plitvički Ljeskovac, Plitvice Lakes NP | 3 | 44°50'27"N, 15°35'40"E | 668 |
| Spring of Crna rijeka, Plitvice Lakes NP | 4 | 44°50'14"N, 15°36'28"E | 680 |
| Upper reach of Crna rijeka, Plitvice Lakes NP | 5 | 44°50'10"N, 15°36'30"E | 670 |
| Crna rijeka by the bridge, Plitvice Lakes NP | 6 | 44°50'22"N, 15°35'59"E | 665 |
| Lake Prošće, Plitvice Lakes NP | 7 | 44°51'33"N, 15°36'09"E | 635 |
| Tufa barrier Labudovac, Plitvice Lakes NP | 8 | 44°52'17"N, 15°35'59"E | 630 |
| Lake Okrugljak, Plitvice Lakes NP | 9 | 44°52'23"N, 15°35'56"E | 626 |
| Lake Batinovac, Plitvice Lakes NP | 10 | 44°52'16"N, 15°36'11"E | 624 |
| Tufa barrier Batinovac-Crno Lake-Malo Lake-Vir, Plitvice Lakes NP | 11 | 44°52'25"N, 15°36'10"E | 603 |
| Tufa barrier Batinovac-Galovac, Plitvice Lakes NP | 12 | 44°52'21"N, 15°36'15"E | 605 |
| Tufa barrier Galovac-Milino, Plitvice Lakes NP | 13 | 44°52'32"N, 15°36'29"E | 594 |
| Lake Gradinsko, Plitvice Lakes NP | 14 | 44°52'39"N, 15°36'37"E | 565 |
| Tufa barrier Burget-Kozjak, Plitvice Lakes NP | 15 | 44°52'47"N, 15°36'53"E | 547 |
| Riječica, Plitvice Lakes NP | 16 | 44°52'27"N, 15°36'47"E | 555 |
| Lake Kozjak, Plitvice Lakes NP | 17 | 44°52'40"N, 15°37'07"E | 535 |
| Tufa barrier Kozjak-Milanovac, Plitvice Lakes NP | 18 | 44°53'39"N, 15°36'32"E | 545 |
| Tufa barrier Milke Trnine, Plitvice Lakes NP | 19 | 44°53'53"N, 15°36'39"E | 540 |
| Tufa barrier Gavanovac-Kaluđerovac, Plitvice Lakes NP | 20 | 44°53'58"N, 15°36'39"E | 537 |
| Lake Kaluđerovac, Plitvice Lakes NP | 21 | 44°54'02"N, 15°36'40"E | 535 |
| Tufa barrier Novakovića Brod, Plitvice Lakes NP | 22 | 44°54'08"N, 15°36'38"E | 505 |
| Stream Sartuk, Plitvice Lakes NP | 23 | 44°55'57"N, 15°33'10"E | 765 |
| Stream Plitvica, Plitvice Lakes NP | 24 | 44°54'08"N, 15°36'27"E | 555 |
| Korana Village, Plitvice Lakes NP | 25 | 44°55'33"N, 15°37'09"E | 390 |

plotted is provided as Figure 1. Photographs of several studied sites are also given (Figs 2–7). Adult specimens were collected using emergence traps (details in Ivković et al. 2013a), sweep nets, yellow pan traps and aspirators, whereas larvae were collected by Surber sampler (25 × 25 cm) and kick-net sampler (25 × 25 cm, 500 µm mesh size). Specimens were preserved in 80% or 96% ethanol (EtOH). We identified the specimens to species level using Thomas (1997) for Athericidae; Reiss and Fittkau (1971); Bitušík (2000), Langton and Pinder (2007a, 2007b), Andersen et al. (2013), Bitušík and Hamerlík (2014), Vallenduuk (2017) for Chironomidae; Disney (1999) for Dixidae; Engel (1938–1946) for Empididae; Gorodkov (1988) for Scathophagidae; and Rozkošný and Kniepert (2000) for Stratiomyidae.

Results and discussion

List of aquatic Diptera of National Park Plitvice Lakes

The following format is used for the distribution data: literature references (name of the site and in parentheses the citation of site ID and the reference); new records (life stage in which the identifications were made, i.e., adult ♂, ♀ and larvae, name of the site and in parentheses the site ID, date of collection and the collector if possible). New

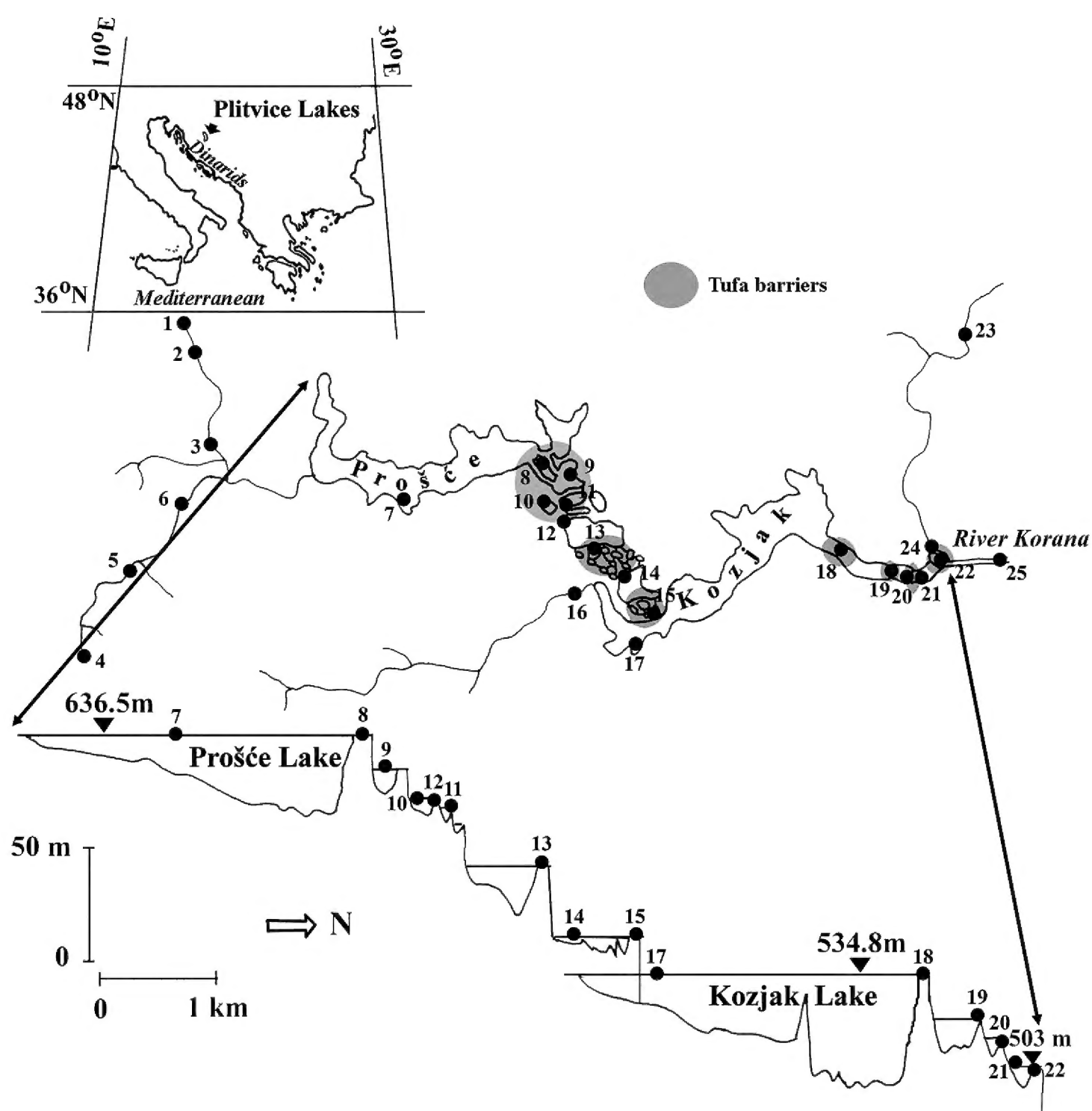


Figure 1. Sampling sites in Plitvice Lakes National Park (see Table 1 for codes).

species for Plitvice Lakes NP are listed with an asterisk before the name of the species. All the sites and site ID are listed in Table 1.

Family Athericidae

Ibisia marginata (Fabricius, 1781)

Literature reference. • tufa barrier Burget-Kozjak, Plitvice Lakes NP (15) (Sertić Perić et al. 2014).

New records. • 1♂; tufa barrier Labudovac, Plitvice Lakes NP (8); 26 Jul. 2010; M. Ivković leg. • 1♂; tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18); 28 Jun.

2012; M. Ivković leg. • 1♀; same site; 25 Jul. 2014; M. Ivković leg. • 3♂, 6♀; tufa barrier Novakovića Brod, Plitvice Lakes NP (22); 25 Jul. 2007; M. Ivković leg. • 10♂, 21♀; same site; 30 Aug. 2007; M. Ivković leg. • 1♂, 6♀; Korana Village, Plitvice Lakes NP (25); 29 Aug. 2008; M. Ivković leg.

Family Chironomidae

Subfamily Chironominae

Cryptochironomus (*Cryptochironomus*) *albofasciatus* (Staeger, 1839)

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Dicrotendipes nervosus (Staeger, 1839)

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Limnochironomus nervosus* (Staeger, 1839) in Kostić-Brnek and Brnek-Kostić (1971), an accepted synonym of *D. nervosus* in Spies and Saether (2013).

Endochironomus gr. *dispar sensu* Moller Pillot, 2009

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Einfeldia dissidens (Walker, 1856)

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Harnischia fuscimanus Kieffer, 1921

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Cryptochironomus fuscimanus* Kieffer, 1921 in Kostić-Brnek and Brnek-Kostić (1971) a synonym of *H. fuscimanus* in Moller Pillot (2009).



Figure 2. Spring of Crna Rijeka, Plitvice Lakes National Park.

***Micropsectra notescens* (Walker, 1856)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Micropsectra uva* Gilka, Zakrzewska, Baranov & Dominiak, 2013**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Gilka et al. 2013, Ivković et al. 2015) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Microtendipes pedellus* (De Geer, 1776)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Microtendipes tarsalis* (Walker, 1856)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

****Nilothauma brayi* (Goetghebuer, 1921)**

New record. • 1 larva; Lake Kozjak, Plitvice Lakes NP (17); 18 Jul. 2018.

***Paracladopelma camptolabis* (Kieffer, 1913)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Paratanytarsus lauterborni* (Kieffer, 1909)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Paratendipes albimanus* (Meigen, 1818)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Phaenopsectra flavipes* (Meigen 1818)**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

New record. • 24 larvae; Lake Kozjak, Plitvice Lakes NP (17); 18 Jul. 2018.

***Polypedilum (Pentapedilum) exsectum* (Kieffer, 1916)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Pentapedilum exsectum* Kieffer, 1913 in Kostić-Brnek and Brnek-Kostić (1971), an accepted synonym of *P. exsectum* in Spies and Saether (2013).



Figure 3. Crna Rijeka by the bridge, Plitvice Lakes National Park.

****Polypedilum (Polypedilum) nubeculosum* (Meigen, 1804)**

New record. • 6 larvae; Lake Kozjak, Plitvice Lakes NP (17); 18 Jul. 2018.

***Polypedilum (Tripodura) scalaenum* (Schränk, 1803)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Polypedilum brevipennatum* Chernovskij, 1949 in Kostić-Brnek and Brnek-Kostić (1971), an accepted synonym of *P. scalaenum* in Spies and Saether (2013).

***Rheotanytarsus nigricauda* Fittkau, 1960**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Rheotanytarsus pentapoda* (Kieffer, 1909)**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Galovac-Milino, Plitvice Lakes NP (13) • tufa barrier Burget-Kozjak, Plitvice Lakes NP (15) • tufa barrier Milke Trnine, Plitvice Lakes NP (19) (Matoničkin et al. 1971, Matoničkin 1987).

Remark. Mentioned as *Rheotanytarsus lapidicola* Kieffer, 1909 in Matoničkin et al. (1971) and Matoničkin (1987), an accepted synonym of *R. pentapoda* in Spies and Saether (2013).

***Stempellina bausei* (Kieffer, 1911)**

Literature references. • Plitvički Ljeskovac, Plitvice Lakes NP (3) (Matoničkin 1987) • Lake Batinovac, Plitvice Lakes NP (10) (Matoničkin et al. 1971) • tufa barrier Batinovac-Crno Lake-Malo Lake-Vir, Plitvice Lakes NP (11) (Matoničkin 1987) • Lake Gradinsko, Plitvice Lakes NP (14) • tufa barrier Burget-Kozjak, Plitvice Lakes NP (15) (Matoničkin et al. 1971).

New records. • 50 larvae; Lake Prošće, Plitvice Lakes NP (7); 17 Sep. 2018 • 92 larvae; Lake Kozjak, Plitvice Lakes NP (17); 18 Jul. 2018.

****Tanytarsus brundini* Lindeberg, 1963**

New record. • 2♂; tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18); 30 Jun. 2009; M. Ivković leg.

***Tanytarsus heusdensis* Goetghebuer, 1923**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Zavrelia pentatoma* Kieffer & Bause, 1913**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Zavreliella marmorata* (van der Wulp, 1859)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Subfamily Diamesinae***Diamesa (Diamesa) thomasi* Serra-Tosio, 1970**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Baranov et al. 2012, Ivković et al. 2015).

***Diamesa (Diamesa) tonsa* (Haliday in Walker, 1856)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

****Potthastia longimanus* Kieffer, 1922**

New record. • 1 larva; Lake Kozjak, Plitvice Lakes NP (17); 18 Jul. 2018.

Subfamily Prodiamesinae***Monodiamesa bathyphila* (Kieffer, 1918)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Prodiamesa olivacea* (Meigen, 1818)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015) • Lake Prošće, Plitvice Lakes NP (7) (Kostić-Brnek and Brnek-Kostić 1971) • tufa barrier Labudovac, Plitvice Lakes NP (8) (Matoničkin et al. 1971, Matoničkin 1987) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971) • tufa barrier Gavanovac-Kaluđerovac, Plitvice Lakes NP (20) (Matoničkin 1987) • Lake Kaluđerovac, Plitvice Lakes NP (21) (Matoničkin et al. 1971).

Subfamily Orthoclaadiinae***Acricotopus lucens* (Zetterstedt, 1850)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Acricotopus lucidus* Brundin, 1949 in Kostić-Brnek and Brnek-Kostić (1971), mentioned as a synonym of *A. lucens* in Moller Pillot (2013).

***Brillia bifida* (Kieffer, 1909)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Brillia longifurca* Kieffer, 1921**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Chaetocladius dentiforceps* (Edwards, 1929)**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Chaetocladius melaleucus* (Meigen, 1818)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

***Cricotopus (Cricotopus) bicinctus* (Meigen, 1818)**

Literature reference. • Stream Plitvica, Plitvice Lakes NP (24) (Matoničkin, 1971).

Remark. Mentioned as *Trichocladius bicinctus* (Meigen, 1818) in Kostić-Brnek and Brnek-Kostić (1971).

***Cricotopus (Cricotopus) fuscus* (Kieffer, 1909)**

Literature reference. • Stream Plitvica, Plitvice Lakes NP (24) (Matoničkin, 1971).

Remark. Mentioned as *Cricotopus (Cricotopus) biformis* Edwards, 1929 in Matoničkin et al. (1971), known as a questionable synonym of *C. (Cricotopus) fuscus* in Ashe and O'Connor (2012).

***Corynoneura lobata* Edwards, 1924**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Eukiefferiella devonica* (Edwards, 1929)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Eukiefferiella gracei* (Edwards, 1929)**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) (Matoničkin et al. 1971).

Remark. Mentioned as *Eukiefferiella longicalcar* Kieffer in Matoničkin et al. (1971), an accepted synonym of *E. gracei* in Spies and Saether (2013).

***Eukiefferiella ilkleyensis* (Edwards, 1929)**

Literature reference. • Stream Plitvica, Plitvice Lakes NP (24) (Matoničkin 1987).

Remark. Mentioned as *Plectrocladius eukiefferiella quadridentata* Chernovskij, 1949 in Matoničkin (1987); see Discussion for more details.

***Eukiefferiella minor* (Edwards, 1929)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

***Epoicocladius ephemerae* (Kieffer, 1924)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Heterotrissocladius marcidus* (Walker, 1856)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

***Limnophyes gurgicola* (Edwards, 1929)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

***Limnophyes* cf. *minimus* sensu Langton & Pinder, 2007**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Metriocnemus* cf. *albolineatus* sensu Langton & Pinder, 2007**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Metriocnemus* *eurynothus* (Holmgren, 1883)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

***Metriocnemus* *intergerivus* Sæther, 1995**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

***Orthocladius* (*Mesorthocladius*) *frigidus* (Zetterstedt, 1838)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Paracladius* *conversus* (Walker, 1856)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Paratrachocladius inserpens* Pankratova, 1970 in Kostić-Brnek and Brnek-Kostić (1971), a synonym of *P. conversus* in Moller Pillot (2013).

***Parametriocnemus* *stylatus* (Spaerck, 1923)**

Literature references. • Plitvički Ljeskovac, Plitvice Lakes NP (3) (Matoničkin 1987) • tufa barrier Burget-Kozjak, Plitvice Lakes NP (15) (Matoničkin et al. 1971, Matoničkin 1987) • tufa barrier Gavanovac-Kaluđerovac, Plitvice Lakes NP (20) • Stream Plitvica, Plitvice Lakes NP (24) (Matoničkin 1987).

New records. • 11 larvae; Lake Kozjak, Plitvice Lakes NP (17); 18 Jul. 2018 • 2♂; tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18); 30 Nov. 2009; M. Ivković leg.

Remark. Mentioned as *Limnophyes transcaucasicus* Chernovskij, 1949 in Matoničkin et al. (1971) and Matoničkin (1987), a synonym of *P. stylatus* in Moller Pillot (2013).

***Parametriocnemus* cf. *stylatus* sensu Moller Pillot, 2013**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Paraphaenocladius* cf. *exagitans* sensu Moller Pillot, 2013**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Paraphaenocladius* *impensus* (Walker, 1856)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

***Paraphaenocladius* cf. *irritus* sensu Moller Pillot, 2013**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Paratrichocladius* *skirwithensis* (Edwards, 1929)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Psectrocladius* (*Psectrocladius*) *barbimanus* (Edwards, 1929)**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) (Matoničkin et al. 1971, Matoničkin 1987) • Crna Rijeka by the bridge, Plitvice Lakes NP (6) • Stream Plitvica, Plitvice Lakes NP (24) (Matoničkin 1987).

***Psectrocladius* (*Psectrocladius*) *psilopterus* (Kieffer, 1906)**

Literature reference. • Crna Rijeka by the bridge, Plitvice Lakes NP (6) (Matoničkin 1987).

***Rheocricotopus* *effusus* (Walker, 1856)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Synorthocladius semivirens* (Kieffer, 1909)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

New record. • 1 larva; Lake Prošće, Plitvice Lakes NP (7); 26 Jul. 2019.

***Thienemannia gracilis* Kieffer, 1909**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Tvetenia veralli* (Edwards, 1929)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

Subfamily Tanypodinae***Ablabesmyia (Ablabesmyia) monilis* (Linnaeus, 1758)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Pentaneura monilis* Linnaeus, 1758 in Kostić-Brnek and Brnek-Kostić (1971).

***Apsectrotanypus trifascipennis* (Zetterstedt, 1838)**

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Psectrotanypus trifascipennis* Zetterstedt, 1838 in Kostić-Brnek and Brnek-Kostić (1971) which is probably a misspelling.

****Labrundinia longipalpis* (Goetghebuer, 1921)**

New record. • 9 larvae; Lake Prošće, Plitvice Lakes NP (7); 26 Jul. 2019.

***Krenopelopia binotata* (Wiedemann, 1817)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

Macropelopia cf. fehlmanni sensu Kieffer, 1912

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Procladius (Holotanypus) choreus (Meigen, 1804)

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Thienemannimyia carnea (Fabricius, 1805)

Literature reference. • Lake Prošće, Plitvice Lakes NP (7) • Lake Kozjak, Plitvice Lakes NP (17) (Kostić-Brnek and Brnek-Kostić 1971).

Remark. Mentioned as *Pentaneura carnea* Fabricius, 1805 in Kostić-Brnek and Brnek-Kostić (1971).

Family Dixidae***Dixa dilatata* Strobl, 1900**

Literature reference. • Stream Sartuk, Plitvice Lakes NP (23) (Ivković and Ivanković 2019).

***Dixa maculata* Meigen, 1818**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • upper reach of Crna rijeka, Plitvice Lakes NP (5) • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) (Ivanković et al. 2019).

***Dixa nebulosa* Meigen, 1830**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • tufa barrier Labudovac, Plitvice Lakes NP (8) (Ivanković et al. 2019) • Lake Kozjak, Plitvice Lakes NP (17) (Ivković and Ivanković 2019). • tufa barrier Kozjak- Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivanković et al. 2019).



Figure 4. Tufa barrier Labudovac, Plitvice Lakes National Park.

***Dixa nubilipennis* Curtis, 1832**

Literature reference. • Korana Village, Plitvice Lakes NP (Ivanković et al. 2019) (25).

***Dixa puberula* Loew, 1849**

Literature reference. • spring of Bijela rijeka stream, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Ivanković et al. 2019) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015) • upper reach of Crna rijeka, Plitvice Lakes NP (5) • Crna rijeka by the bridge, Plitvice Lakes NP (6) (Ivanković et al. 2019) • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak- Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) (Ivanković et al. 2019, Ivković and Ivanković 2019) • Korana Village, Plitvice Lakes NP (25) (Ivanković et al. 2019).

***Dixa submaculata* Edwards, 1920**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • upper reach of Crna rijeka, Plitvice Lakes NP (5)

• Crna rijeka by the bridge, Plitvice Lakes NP (6) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) (Ivanković et al. 2019).

***Dixella aestivalis* (Meigen, 1818)**

Literature reference. • Lake Okrugljak, Plitvice Lakes NP (9) • Riječica, Plitvice Lakes NP (16) (Matoničkin 1987).

***Dixella amphibia* (De Geer, 1776)**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) (Matoničkin 1987).

New record. • 1 larva; lake Kozjak, Plitvice Lakes NP (17); 11 Jul. 2019.

****Dixella autumnalis* (Meigen, 1838)**

New record. • 1 larva; lake Kozjak, Plitvice Lakes NP (17); 18 Jul. 2018.

Family Empididae

Subfamily Clinocerinae

***Clinocera stagnalis* (Haliday, 1833)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2010, 2012a).

New record. • 1♂; tufa barrier Labudovac, Plitvice Lakes NP (8); 26 Jul. 2013; M. Ivković leg.

***Clinocera wesmaeli* (Macquart, 1835)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2010, 2012a).

***Dolichocephala guttata* (Haliday, 1833)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) • up-

per reach of Crna rijeka, Plitvice Lakes NP (5) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2010, 2012a).

***Dolichocephala ocellata* (Costa, 1854)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Ivković et al. 2010, 2012a).

***Kowarzia barbatula* (Mik, 1880)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna rijeka, Plitvice Lakes NP (4) • upper reach of Crna rijeka, Plitvice Lakes NP (5) • Crna rijeka by the bridge, Plitvice Lakes NP (6) • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2010, 2012a).

***Kowarzia bipunctata* (Haliday, 1833)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Ivković et al. 2010).

***Wiedemannia aquilex* (Loew, 1869)**

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) • upper reach of Crna rijeka, Plitvice Lakes NP (5) • Crna rijeka by the bridge, Plitvice Lakes NP (6) (Ivković et al. 2010, 2012a).

***Wiedemannia lamellata* (Loew, 1869)**

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2010, 2012a).

***Wiedemannia zetterstedti* (Fallén, 1826)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2010).



Figure 5. Tufa barrier Galovac-Milino, Plitvice Lakes National Park.

Subfamily Hemerodromiinae

Chelifera concinnicauda Collin, 1927

Literature references. • Crna rijeka by the bridge, Plitvice Lakes NP (6) • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2010, 2012a) • Korana Village, Plitvice Lakes NP (25) (Horvat 1990, Ivković et al. 2010, 2012a).

Chelifera flavella (Zetterstedt, 1838)

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) • upper reach of Crna rijeka, Plitvice Lakes NP (5) (Ivković et al. 2010, 2012a).

Chelifera precabunda Collin, 1961

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) •

upper reach of Crna rijeka, Plitvice Lakes NP (5) • Crna rijeka by the bridge, Plitvice Lakes NP (6) (Ivković et al. 2010, 2012a).

***Chelifera precatoria* (Fallén, 1816)**

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) (Ivković et al. 2010, 2012a).

***Chelifera pyrenaica* Vaillant, 1981**

Literature references. • Crna rijeka by the bridge, Plitvice Lakes NP (6) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2010, 2012a).

***Chelifera siveci* Wagner, 1984**

Literature references. • spring of Bijela Rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna Rijeka, Plitvice Lakes NP (4) • upper reach of Crna rijeka, Plitvice Lakes NP (5) • Crna rijeka by the bridge, Plitvice Lakes NP (6) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2010, 2012a).

***Chelifera stigmatica* (Schiner, 1862)**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2010, 2012a).

***Chelifera trapezina* (Zetterstedt, 1838)**

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes (4) • upper reach of Crna rijeka, Plitvice Lakes NP (5) • Crna rijeka by the bridge, Plitvice Lakes NP (6) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2010, 2012a).

***Hemerodromia laudatoria* Collin, 1927**

Literature references. • Crna rijeka by the bridge, Plitvice Lakes NP (6) • Lake Prošće, Plitvice Lakes NP (7) (Ivković et al. 2010, 2012a).

***Hemerodromia melangyna* Collin, 1927**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2010, 2012a) • Korana Village, Plitvice Lakes NP (25) (Horvat 1990, Ivković et al. 2010, 2012a).

New record. • 1♂, 43♀; tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18); 29 Jun. 2015.

***Hemerodromia oratoria* (Fallén, 1816)**

Literature references. • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2010, 2012a).

***Hemerodromia raptoria* Meigen, 1830**

Literature references. • Lake Kozjak, Plitvice Lakes NP (17) (Ivković et al. 2010, 2012a) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Ivković et al. 2013b).

***Hemerodromia unilineata* Zetterstedt, 1842**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2010, 2012a).

Family Limoniidae**Subfamily Chioneinae*****Ellipteroides (Ellipteroides) lateralis* (Macquart, 1835)**

Literature reference. • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Kolcsár et al. 2015).

***Gonomyia (Gonomyia) tenella* (Meigen, 1818)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • Korana Village, Plitvice Lakes NP (25) (Kolcsár et al. 2015).

***Molophilus (Molophilus) bifidus* Goetghebuer, 1920**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Kolcsár et al. 2015).

***Molophilus (Molophilus) repentinus* Starý, 1971**

Literature reference. • Korana Village, Plitvice Lakes NP (25) (Kolcsár et al. 2015).

***Ormosia (Oreophila) bergrothi* (Strobl, 1895)**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Kolcsár et al. 2015).

***Rhabdomastix (Rhabdomastix) edwardsi* Tjeder, 1967**

Literature reference. • Korana Village, Plitvice Lakes NP (25) (Kolcsár et al. 2015).

***Rhypholophus phryganopterus* Kolenati, 1860**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Kolcsár et al. 2015).

Subfamily Limnophilinae***Eloeophila apicata* (Loew, 1871)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Kolcsár et al. 2015).

***Eloeophila maculata* (Meigen, 1804)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • Crna rijeka by the bridge, Plitvice Lakes NP (6) (Kolcsár et al. 2015).

***Epiphragma (Epiphragma) ocellare* (Linnaeus, 1760)**

Literature reference. • spring of Crna rijeka, Plitvice Lakes NP (4) (Kolcsár et al. 2015).

Remark. This species is not aquatic. Larvae develop in forests, woodlands, larvae associated with woody debris.

***Hexatoma (Eriocera) chirothecata* (Scopoli, 1763)**

Literature reference. • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Korana Village, Plitvice Lakes NP (25) (Kolcsár et al. 2015).

***Paradelphomyia senilis* (Haliday, 1833)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) (Kolcsár et al. 2015).

Subfamily Limoniinae***Antocha (Antocha) vitripennis* (Meigen, 1830)**

Literature reference. • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Korana Village, Plitvice Lakes NP (25) (Kolcsár et al. 2015).

***Dicranomyia (Dicranomyia) chorea* (Meigen, 1818)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Kolcsár et al. 2015).

Remark. Larvae associated with rotting woody debris, but sometimes also reared from semiaquatic habitats; larvae possibly feeding in partially submerged wood.

***Dicranomyia (Dicranomyia) didyma* (Meigen, 1804)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • Stream Plitvica, Plitvice Lakes NP (24) (Kolcsár et al. 2015).



Figure 6. Lake Kaluđerovac and Tufa barrier Novakovića Brod, Plitvice Lakes National Park.

***Dicranomyia (Dicranomyia) imbecilla* Lackschewitz, 1941**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Kolcsár et al. 2015).

***Dicranomyia (Dicranomyia) mitis* (Meigen, 1830)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Kolcsár et al. 2015).

Remarks. Mentioned as *Dicranomyia (Dicranomyia) mitis* (Meigen, 1830) complex by Kolcsár et al. (2015). After re-identification of specimens by Kolcsár L.-P., using the identification key published by Starý and Stubbs (2015), it was confirmed that the specimens belong to *Dicranomyia (Dicranomyia) mitis* (Meigen, 1830).

***Limonia hercegovinae* (Strobl, 1898)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) (Kolcsár et al. 2015).

Remark. Larvae unknown, but perhaps not associated with aquatic habitats as other *Limonia* species have terrestrial larvae.

***Lipsothrix nobilis* Loew, 1873**

Literature reference. • Crna rijeka by the bridge, Plitvice Lakes NP (6) • tufa barrier Labudovac, Plitvice Lakes NP (8) (Kolcsár et al. 2015).

Family Muscidae

Subfamily Coenosiinae

***Limnophora croatica* Pont & Ivković, 2013**

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Pont and Ivković 2013, Ivković and Pont 2016) • spring of Crna Rijeka, Plitvice Lakes NP (4) (Pont and Ivković 2013) • tufa barrier Labudovac, Plitvice Lakes NP (8) (Pont and Ivković 2013, Ivković and Pont 2016) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Pont and Ivković 2013).

***Limnophora olympiae* Lyneborg, 1965**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Pont and Ivković 2013, Ivković and Pont 2016).

***Limnophora pulchriceps* (Loew, 1860)**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Pont and Ivković 2013, Ivković and Pont 2016) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) (Pont and Ivković 2013).

***Limnophora riparia* (Fallén, 1824)**

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Pont and Ivković 2013) • tufa barrier Labudovac, Plitvice Lakes NP (8) (Matoničkin et al. 1971, Pont and Ivković 2013, Ivković and Pont 2016) • tufa barrier Batinovac-Galovac, Plitvice Lakes NP (12) • tufa barrier Galovac-Milino, Plitvice Lakes NP (13) • tufa barrier Burget-Kozjak, Plitvice Lakes NP

(15) (Matoničkin et al. 1971) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Pont and Ivković 2013, Ivković and Pont 2016) • tufa barrier Milke Trnine, Plitvice Lakes NP (19) (Matoničkin et al. 1971) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Pont and Ivković 2013).

***Limnophora setinerva* Schnabl, 1911**

Literature references. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Pont and Ivković 2013) • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Pont and Ivković 2013, Ivković and Pont 2016) • Stream Plitvica, Plitvice Lakes NP (24) (Pont and Ivković 2013).

***Limnophora tigrina* (Am Stein, 1860)**

Literature reference. • Korana Village, Plitvice Lakes NP (25) (Pont and Ivković 2013).

***Limnophora triangula* (Fallén, 1825)**

Literature reference. • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Ivković and Pont 2016) • Korana Village, Plitvice Lakes NP (25) (Pont and Ivković 2013).

***Lispe tentaculata* (De Geer, 1776)**

Literature reference. • Korana Village, Plitvice Lakes NP (25) (Ivković and Pont 2015).

***Lispocephala brachialis* (Rondani, 1877)**

Literature reference. • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Ivković and Pont 2015).

***Lispocephala spuria* (Zetterstedt, 1838)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković and Pont 2015).



Figure 7. Stream Plitvica, Plitvice Lakes National Park.

Family Pediciidae

Subfamily Pediciinae

***Dicranota (Dicranota) bimaçulata* (Schummel, 1829)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Kolcsár et al. 2015).

***Dicranota (Paradicranota) pavidà* (Haliday, 1833)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Kolcsár et al. 2015).

***Pedicia (Amalopis) occulta* (Meigen, 1830)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) • Crna rijeka by the bridge, Plitvice Lakes NP (6) (Kolcsár et al. 2015).

***Tricyphona (Tricyphona) immaculata* (Meigen, 1804)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • spring of Crna rijeka, Plitvice Lakes NP (4) • tufa barrier Labudovac, Plitvice Lakes NP (8) (Kolcsár et al. 2015).

Family Psychodidae**Subfamily Sycoracinae*****Sycorax feuerborni* Jung, 1954**

Literature reference. • spring of Crna Rijeka, Plitvice Lakes NP (4) (Ivković et al. 2015).

***Sycorax tonnoiri* Jung, 1953**

Literature reference. • spring of Crna Rijeka, Plitvice Lakes NP (4) (Kvifte et al. 2013, Ivković et al. 2015).

Subfamily Psychodinae***Berdeniella keroveci* Kvifte, Ivković & Klarić, 2013**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) • spring of Crna Rijeka, Plitvice Lakes NP (4) (Kvifte et al. 2013, Ivković et al. 2015).

***Pericoma blandula* Eaton, 1893**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) (Kvifte et al. 2013).

***Pericoma miljenkoi* Kvifte & Ivković, 2018**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Kvifte and Ivković 2018).

***Pericoma pseudocalcilega* Krek, 1972**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) (Kvifte et al. 2013).

***Psychoda (Logima) albipennis* Zetterstedt, 1850 complex**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Kvifte et al. 2013).

***Psychoda (Psychodocha) gemina* (Eaton, 1904)**

Literature reference. • spring of Crna Rijeka, Plitvice Lakes NP (4) (Kvifte et al. 2013, Ivković et al. 2015).

***Jungiella valachia* (Vaillant, 1963)**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Kvifte et al. 2013, Ivković et al. 2015).

Family Scathophagidae**Subfamily Scathophaginae******Acanthocnema latipennis* Becker, 1894**

New records. • 4♂; spring of Bijela rijeka, Plitvice Lakes NP (1); 26 Jul. 2016; M. Ivković leg. • 2♂; tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18); 29 Apr. 2015; M. Ivković leg.

Family Simuliidae**Subfamily Simuliinae*****Prosimulium tomosvaryi* (Enderlein, 1921)**

Literature references. • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2012b, 2014).

***Simulium (Eusimulium) angustipes* Edwards, 1915**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2012b, 2014).

***Simulium (Eusimulium) rubzovianum* (Sherban, 1961)**

Literature reference. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) (Ivković et al. 2016).

***Simulium (Nevermannia) angustitarse* (Lundström, 1911)**

Literature reference. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) (Ivković et al. 2016).

***Simulium (Nevermannia) costatum* Friederichs, 1920**

Literature references. • spring of Bijela Rijeka, Plitvice Lakes NP (1) • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • upper reach of Crna rijeka, Plitvice Lakes NP (5) • Crna rijeka by the bridge, Plitvice Lakes NP (6) • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2012b, 2014).

***Simulium (Simulium) monticola* Friederichs, 1920**

Literature references. • upper reach of Bijela rijeka, Plitvice Lakes NP (2) • Crna rijeka by the bridge, Plitvice Lakes NP (6) • tufa barrier Labudovac, Plitvice Lakes NP (8) (Ivković et al. 2012b, 2014).

New record. • 7♂; tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18); 28 Jun. 2007; M. Ivković leg.

***Simulium (Simulium) ornatum* Meigen, 1818 (complex)**

Literature references. • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2012b, 2014).

New records. • 4♂; tufa barrier Labudovac, Plitvice Lakes NP (8); 29 May 2009; M. Ivković leg. • 3♂; same site; 30 Jun. 2009; M. Ivković leg.

***Simulium (Simulium) trifasciatum* Curtis, 1839**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) (Ivković et al. 2012b, 2014).

***Simulium (Simulium) tuberosum* (Lundström, 1911)**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2012b, 2014).

***Simulium (Simulium) variegatum* Meigen, 1818**

Literature references. • tufa barrier Labudovac, Plitvice Lakes NP (8) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Stream Plitvica, Plitvice Lakes NP (24) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2012b, 2014).

***Simulium (Trichodagmia) auricoma* Meigen, 1818**

Literature references. • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) • Korana Village, Plitvice Lakes NP (25) (Ivković et al. 2012b, 2014).

***Simulium (Wilhelmia) pseudequinum* Séguy, 1921**

Literature references. • tufa barrier Kozjak-Milanovac, Plitvice Lakes NP (18) • tufa barrier Novakovića Brod, Plitvice Lakes NP (22) (Ivković et al. 2012b, 2014).

Remark. Formerly this was misidentified as *Simulium (Wilhelmia) equinum* (Linnaeus, 1758) in Ivković et al. (2012, 2014, 2016).

Family Stratiomyidae****Oxycera pardalina* Meigen, 1822**

New records. • 1 larva; spring of Bijela rijeka, Plitvice Lakes NP (1); 30 May 2008; M. Ivković leg. • 6 larvae; upper reach of Bijela rijeka, Plitvice Lakes NP (2); 29 May

2007; M. Ivković leg. • 1 ♀; same site; 26 Jul. 2010; M. Ivković leg. • 1 larva; upper reach of Crna rijeka, Plitvice Lakes NP (5); 30 Apr. 2007; M. Ivković leg. • 4 larvae; same site; 29 May 2007; M. Ivković leg. • 1 larva, 1 ♀; same site; 30 Jun. 2007; M. Ivković leg. • 2 larvae; same site; 30 Apr. 2008; M. Ivković leg. • 1 larva; same site; 30 May 2008; M. Ivković leg. • 1 ♀; tufa barrier Labudovac, Plitvice Lakes NP (8); 30 Jun. 2008; M. Ivković leg. • 1 ♂; same site; 30 Jun. 2011; M. Ivković leg. • 1 ♀; same site; 28 Jun. 2012; M. Ivković leg.

****Oxycera limbata* Loew, 1862**

New records. • 1 ♀; tufa barrier Labudovac, Plitvice Lakes NP (8); 25 Jul. 2011; M. Ivković leg. • 3 ♂; Korana Village, Plitvice Lakes NP (25); 29 Jun. 2007; M. Ivković leg.

****Oxycera turcica* Ustuner & Hasbenli, 2004**

New records. • 3 ♂, 2 ♀; Korana Village, Plitvice Lakes NP (25); 29 Jun. 2007; M. Ivković leg. • 1 ♂, 2 ♀; same site; 26 Jul. 2007; M. Ivković leg.

****Nemotelus pantherinus* (Linnaeus, 1758)**

New record. • 1 ♀; upper reach of Bijela rijeka, Plitvice Lakes NP (1); 24 Jul. 2009; M. Ivković leg.

****Oplodontha viridula* (Fabricius, 1775)**

New record. • 1 ♀; tufa barrier Labudovac, Plitvice Lakes NP (8); 26 Jul. 2010; M. Ivković leg.

Family Tabanidae

Subfamily Chrysopsinae

***Chrysops caecutiens* (Linnaeus, 1758)**

Literature reference. • Plitvički Ljeskovac, Plitvice Lakes NP (3) (Krčmar et al. 2008).

***Chrysops viduatus* (Fabricius, 1794)**

Literature reference. • Plitvički Ljeskovac, Plitvice Lakes NP (3) (Krčmar et al. 2008).

Family Tipulidae**Subfamily Tipulinae*****Tipula (Savtshenkia) rufina rufina* Meigen, 1818**

Literature reference. • spring of Bijela rijeka, Plitvice Lakes NP (1) (Ivković et al. 2015).

New records. • 2♂; spring of Bijela rijeka, Plitvice Lakes NP (1); 1 Oct. 2009; M. Ivković leg. • 1♂; spring of Bijela rijeka, Plitvice Lakes NP (1); 2 Nov. 2011; M. Ivković leg. • 1♀; spring of Bijela rijeka, Plitvice Lakes NP (1); 27 Jun. 2013; M. Ivković leg.

Species richness and assemblage composition

In total, 157 species and 7 taxa of aquatic Diptera (Table 2) belonging to 13 families, collected from 25 sites (Table 1, Figure 1) are recorded in the Plitvice Lakes NP, with twelve species new for the dipteran fauna of the National Park. New species belonging to the family Chironomidae are *Labrundinia longipalpis* (Goetghebuer, 1921), *Nilothauma brayi* (Goetghebuer, 1921), *Potthastia longimanus* Kieffer, 1922, *Polypedilum (Polypedilum) nubeculosum* (Meigen, 1804) and *Tanytarsus brundini* Lindeberg, 1963; to the family Dixidae is *Dixella autumnalis* (Meigen, 1838), and Scathophagidae *Acanthocnema latipennis* Becker, 1894. New species found in the Plitvice Lakes NP belonging to Stratiomyidae family are *Oxycera pardalina* Meigen, 1822, *Oxycera limbata* Loew, 1862, *Oxycera turcica* Ustuner & Hasbenli, 2004, *Nemotelus pantherinus* (Linnaeus, 1758), and *Oplodontha viridula* (Fabricius, 1775).

Overall, the greatest species richness was recorded within the family Chironomidae, with 62 species (and additional seven taxa) recorded so far in Plitvice Lakes NP (Table 2, Figure 8). This was expected since the Chironomidae are an extremely diverse group with more than 8000 described species (Marshall 2012), and with many more undescribed or waiting to be discovered. Some chironomid species have been mentioned in the literature, but are not included in the formal list for various reasons that are considered here. The species *Micropsectra curvicornis* (Chernovskij, 1949) listed in Kostić-Brnek and Brnek-Kostić (1971) and *Thienemanniella flaviforceps* Kieffer, 1925, mentioned from Plitvice in Matoničkin (1987), are considered to be *nomina dubia* in Ashe and Cranston (1990), as well as in Ashe and O'Connor (2012). *Ablabesmyia* cf. *tetrasticta* could possibly be a misinterpretation of the name *Pelopia tetrasticta* Kieffer, 1916 and as such is considered a *nomen dubium* in the subfamily Tanypodinae (Ashe and O'Connor 2009). Furthermore, the species *Cricotopus latidentatus* (Chernovskij, 1949), published in Matoničkin (1987) and Matoničkin et al. (1971), is considered a questionable synonym within the genus *Cricotopus* according to the Ashe and O'Connor (2012). *Cricotopus filiformis* Edwards, mentioned in Matoničkin (1987), is considered an unidentifiable error since Edwards never described a chironomid species with “fili” in the name (Ashe and Cranston 1990). Chironomidae species that are part of the formal species list, but should be addressed with caution, are also considered.

Table 2. Aquatic Diptera at different types of karstic habitats in National Park Plitvice Lakes.

| Species/Habitat type | Spring | Stream | Tufa barrier | Lake |
|--|--------|--------|--------------|------|
| Athericidae | | | | |
| <i>Ibisia marginata</i> (Fabricius, 1781) | | • | • | |
| Chironomidae | | | | |
| <i>Ablabesmyia</i> (<i>Ablabesmyia</i>) <i>monilis</i> (Linnaeus, 1758) | | | | • |
| <i>Acricotopus lucens</i> (Zetterstedt, 1850) | | | | • |
| <i>Apsectrotanypus trifascipennis</i> (Zetterstedt, 1838) | | | | • |
| <i>Brillia bifida</i> (Kieffer, 1909) | • | | | |
| <i>Brillia longifurca</i> Kieffer, 1921 | | | | • |
| <i>Chaetocladius dentiforceps</i> (Edwards, 1929) | • | | | |
| <i>Chaetocladius melaleucus</i> (Meigen, 1818) | • | | | |
| <i>Corynoneura lobata</i> Edwards, 1924 | • | | | |
| <i>Cricotopus</i> (<i>Cricotopus</i>) <i>bicinctus</i> (Meigen, 1818) | | | | • |
| <i>Cricotopus</i> (<i>Cricotopus</i>) <i>fuscus</i> (Kieffer, 1909) | | • | | |
| <i>Cryptochironomus</i> (<i>Cryptochironomus</i>) <i>albofasciatus</i> (Staeger, 1839) | | | | • |
| <i>Diamesa</i> (<i>Diamesa</i>) <i>thomasi</i> Serra-Tosio, 1970 | • | | | |
| <i>Diamesa</i> (<i>Diamesa</i>) <i>tonsa</i> (Haliday in Walker, 1856) | • | | | |
| <i>Dicrotendipes nervosus</i> (Staeger, 1839) | | | | • |
| <i>Einfeldia dissidens</i> (Walker, 1856) | | | | • |
| <i>Endochironomus</i> cf. <i>dispar sensu</i> Moller Pillot, 2009 | | | | • |
| <i>Epoicocladius ephemerae</i> (Kieffer, 1924) | • | | | |
| <i>Eukiefferiella devonica</i> (Edwards, 1929) | • | | | |
| <i>Eukiefferiella ilkleyensis</i> (Edwards, 1929) | • | | | |
| <i>Eukiefferiella minor</i> (Edwards, 1929) | • | | | |
| <i>Eukiefferiella gracei</i> (Edwards, 1929) | • | | | |
| <i>Harinischia fuscimanus</i> Kieffer, 1921 | | | | • |
| <i>Heterotrissocladius marcidus</i> (Walker, 1856) | | | | • |
| <i>Krenopelopia binotata</i> (Wiedemann, 1817) | • | | | |
| <i>Labrundinia longipalpis</i> (Goetghebuer, 1921) | | | | • |
| <i>Limnophyes</i> cf. <i>minimus sensu</i> Langton & Pinder, 2007 | • | | | |
| <i>Limnophyes gurgicola</i> (Edwards, 1929) | • | | | |
| <i>Macropelopia</i> cf. <i>fehlmanni sensu</i> Kieffer, 1912 | | | | • |
| <i>Metriocnemus</i> cf. <i>albolineatus sensu</i> Langton & Pinder, 2007 | • | | | |
| <i>Metriocnemus eurynothus</i> (Holmgren, 1883) | • | | | |
| <i>Metriocnemus intergerivus</i> Sæther, 1995 | • | | | |
| <i>Micropsectra notescens</i> (Walker, 1856) | • | | | |
| <i>Micropsectra uva</i> Gilka, Zakrzewska, Baranov & Dominiak, 2013 | • | | | |
| <i>Microtendipes pedellus</i> (De Geer, 1776) | | | | • |
| <i>Microtendipes tarsalis</i> (Walker, 1856) | | | | • |
| <i>Monodiamesa bathyphila</i> (Kieffer, 1918) | | | | • |
| <i>Nilothauma brayi</i> (Goetghebuer, 1921) | | | | • |
| <i>Orthocladius</i> (<i>Mesorthocladius</i>) <i>frigidus</i> (Zetterstedt 1838) | • | | | |
| <i>Paracladius conversus</i> (Walker, 1856) | | | | • |
| <i>Paracladopelma camptolabis</i> (Kieffer, 1913) | | | | • |
| <i>Parametriocnemus</i> cf. <i>stylatus sensu</i> Moller Pillot, 2013 | • | | | |
| <i>Parametriocnemus stylatus</i> (Spaerck, 1923) | | • | • | |
| <i>Paraphaenocladius</i> cf. <i>exagitans sensu</i> Moller Pillot, 2013 | • | | | |
| <i>Paraphaenocladius impensus</i> (Walker, 1856) | • | | | |
| <i>Paraphaenocladius</i> cf. <i>irritus sensu</i> Moller Pillot, 2013 | • | | | |
| <i>Paratanytarsus lauterborni</i> (Kieffer, 1909) | | | | • |
| <i>Paratendipes albimanus</i> (Meigen, 1818) | | | | • |
| <i>Paratrachocladius skirwithensis</i> (Edwards, 1929) | • | | | |
| <i>Phaenopsectra flavipes</i> (Meigen 1818) | • | | | • |
| <i>Polypedilum</i> (<i>Pentapedilum</i>) <i>exsectum</i> (Kieffer, 1916) | | | | • |
| <i>Polypedilum</i> (<i>Polypedilum</i>) <i>nubeculosum</i> (Meigen, 1804) | | | | • |
| <i>Polypedilum</i> (<i>Tripodura</i>) <i>scalaenum</i> (Schränk, 1803) | | | | • |
| <i>Potthastia longimanus</i> Kieffer, 1922 | | | | • |

| Species/Habitat type | Spring | Stream | Tufa barrier | Lake |
|--|--------|--------|--------------|------|
| <i>Procladius (Holotanypus) choreus</i> (Meigen, 1804) | | | | • |
| <i>Prodiamesa olivacea</i> (Meigen, 1818) | • | | • | • |
| <i>Psectrocladius (Psectrocladius) barbimanus</i> (Edwards, 1929) | | • | • | |
| <i>Psectrocladius (Psectrocladius) psilopterus</i> (Kieffer, 1906) | | • | | |
| <i>Rheocricotopus effusus</i> (Walker, 1856) | • | | | |
| <i>Rheotanytarsus nigricauda</i> Fittkau, 1960 | • | | | |
| <i>Rheotanytarsus pentapoda</i> (Kieffer, 1909) | | | • | |
| <i>Stempellina bausei</i> (Kieffer, 1911) | | • | • | • |
| <i>Synorthocladius semivirens</i> (Kieffer, 1909) | • | | | |
| <i>Tanytarsus brundini</i> Lindeberg, 1963 | | | • | |
| <i>Tanytarsus heusdensis</i> Goetghebuer, 1923 | | | | • |
| <i>Thienemannia gracilis</i> Kieffer, 1909 | • | | | |
| <i>Thienemannimyia carnea</i> (Fabricius, 1805) | | | | • |
| <i>Tvetenia veralli</i> (Edwards, 1929) | • | | | |
| <i>Zavrelia pentatoma</i> Kieffer & Bause, 1913 | | | | • |
| <i>Zavreliella marmorata</i> (van der Wulp, 1859) | | | | • |
| Dixidae | | | | |
| <i>Dixa dilatata</i> Strobl, 1900 | | • | | |
| <i>Dixa maculata</i> Meigen, 1818 | | • | • | |
| <i>Dixa nebulosa</i> Meigen, 1830 | | • | • | • |
| <i>Dixa nubilipennis</i> Curtis, 1832 | | • | | |
| <i>Dixa puberula</i> Loew, 1849 | • | • | • | |
| <i>Dixa submaculata</i> Edwards, 1920 | • | • | • | |
| <i>Dixella aestivalis</i> (Meigen, 1818) | | • | | • |
| <i>Dixella amphibia</i> (De Geer, 1776) | | | • | |
| <i>Dixella autumnalis</i> (Meigen, 1838) | | | | • |
| Empididae | | | | |
| <i>Chelifera concinnicauda</i> Collin, 1927 | | • | • | |
| <i>Chelifera flavella</i> (Zetterstedt, 1838) | • | • | | |
| <i>Chelifera precabunda</i> Collin, 1961 | • | • | | |
| <i>Chelifera precatoria</i> (Fallén, 1816) | • | • | | |
| <i>Chelifera pyrenaica</i> Vaillant, 1981 | | • | • | |
| <i>Chelifera siveci</i> Wagner, 1984 | • | • | | |
| <i>Chelifera stigmatica</i> (Schiner, 1862) | | • | • | |
| <i>Chelifera trapezina</i> (Zetterstedt, 1838) | • | • | | |
| <i>Clinocera stagnalis</i> (Haliday, 1833) | • | • | | |
| <i>Clinocera wesmaeli</i> (Macquart, 1835) | • | | | |
| <i>Dolichocephala guttata</i> (Haliday, 1833) | • | • | | |
| <i>Dolichocephala ocellata</i> (Costa, 1854) | • | • | | |
| <i>Hemerodromia laudatoria</i> Collin, 1927 | | • | | • |
| <i>Hemerodromia melangyna</i> Collin, 1927 | | • | • | |
| <i>Hemerodromia oratoria</i> (Fallén, 1816) | | • | • | |
| <i>Hemerodromia raptoria</i> Meigen, 1830 | | | • | • |
| <i>Hemerodromia unilineata</i> Zetterstedt, 1842 | | • | • | |
| <i>Kowarzia barbatula</i> (Mik, 1880) | • | • | • | |
| <i>Kowarzia bipunctata</i> (Haliday, 1833) | | • | | |
| <i>Wiedemannia aquilex</i> (Loew, 1869) | • | • | | |
| <i>Wiedemannia lamellata</i> (Loew, 1869) | • | • | • | |
| <i>Wiedemannia zetterstedti</i> (Fallén, 1826) | • | | | |
| Limoniidae | | | | |
| <i>Antocha (Antocha) vitripennis</i> (Meigen, 1830) | | • | • | |
| <i>Dicranomyia (Dicranomyia) chorea</i> (Meigen, 1818) | • | • | • | |
| <i>Dicranomyia (Dicranomyia) didyma</i> (Meigen, 1804) | • | • | • | |
| <i>Dicranomyia (Dicranomyia) imbecilla</i> Lackschewitz, 1941 | • | | • | |
| <i>Dicranomyia (Dicranomyia) mitis</i> (Meigen, 1830) complex | | • | | |
| <i>Ellipteroides (Ellipteroides) lateralis</i> (Macquart, 1835) | | | • | |
| <i>Eloeophila apicata</i> (Loew, 1871) | | • | | |
| <i>Eloeophila maculata</i> (Meigen, 1804) | | • | | |

| Species/Habitat type | Spring | Stream | Tufa barrier | Lake |
|---|--------|--------|--------------|------|
| <i>Epiphragma</i> (<i>Epiphragma</i>) <i>ocellare</i> (Linnaeus, 1760) | • | | | |
| <i>Gonomyia</i> (<i>Gonomyia</i>) <i>tenella</i> (Meigen, 1818) | • | • | | |
| <i>Hexatoma</i> (<i>Eriocera</i>) <i>chirothecata</i> (Scopoli, 1763) | | • | • | |
| <i>Limonia hercegovinae</i> (Strobl, 1898) | • | • | | |
| <i>Lipsothrix nobilis</i> Loew, 1873 | | • | • | |
| <i>Molophilus</i> (<i>Molophilus</i>) <i>bifidus</i> Goetghebuer, 1920 | • | | | |
| <i>Molophilus</i> (<i>Molophilus</i>) <i>repentinus</i> Starý, 1971 | | • | | |
| <i>Ormosia</i> (<i>Oreophila</i>) <i>bergrothi</i> (Strobl, 1895) | • | | | |
| <i>Paradelphomyia</i> (<i>Oxyrhiza</i>) <i>senilis</i> (Haliday, 1833) | • | • | | |
| <i>Rhabdomastix</i> (<i>Rhabdomastix</i>) <i>edwardsi</i> Tjeder, 1967 | | • | | |
| <i>Rhypholophus phryganopterus</i> Kolenati, 1860 | • | | | |
| Muscidae | | | | |
| <i>Limnophora croatica</i> Pont & Ivković, 2013 | • | • | • | |
| <i>Limnophora olympiae</i> Lyneborg, 1965 | • | | • | |
| <i>Limnophora pulchriceps</i> (Loew, 1860) | | • | • | |
| <i>Limnophora riparia</i> (Fallén, 1824) | • | • | • | |
| <i>Limnophora setinervia</i> Schnabl, 1911 | • | • | • | |
| <i>Limnophora tigrina</i> (Am Stein, 1860) | | • | | |
| <i>Limnophora triangula</i> (Fallén, 1825) | | • | • | |
| <i>Lispe tentaculata</i> (De Geer, 1776) | | • | | |
| <i>Lispocephala brachialis</i> (Rondani, 1877) | | | • | |
| <i>Lispocephala spuria</i> (Zetterstedt, 1838) | • | | | |
| Pediciidae | | | | |
| <i>Dicranota</i> (<i>Dicranota</i>) <i>bimaculata</i> (Schummel, 1829) | • | | | |
| <i>Dicranota</i> (<i>Paradicranota</i>) <i>pavida</i> (Haliday, 1833) | | • | | |
| <i>Pedicia</i> (<i>Amalopsis</i>) <i>occulta</i> (Meigen, 1830) | • | • | | |
| <i>Tricyphona</i> (<i>Tricyphona</i>) <i>immaculata</i> (Meigen, 1804) | • | • | • | |
| Psychodidae | | | | |
| <i>Sycorax feuerborni</i> Jung, 1954 | • | | | |
| <i>Sycorax tonnoiri</i> Jung, 1953 | • | | | |
| <i>Berdeniella keroveci</i> Kvifte, Ivković & Klarić, 2013 | • | | | |
| <i>Pericoma blandula</i> Eaton, 1893 | | | • | |
| <i>Pericoma miljenkoi</i> Kvifte & Ivković, 2018 | | | • | |
| <i>Pericoma pseudocalcilega</i> Krek, 1972 | | | • | |
| <i>Psychoda</i> (<i>Logima</i>) <i>albipennis</i> Zetterstedt, 1850 complex | • | | | |
| <i>Psychoda</i> (<i>Psychodocha</i>) <i>gemina</i> (Eaton, 1904) | • | | | |
| <i>Jungiella valachia</i> (Vaillant, 1963) | • | | | |
| Scathophagidae | | | | |
| <i>Acanthocnema latipennis</i> Becker, 1894 | • | | • | |
| Simuliidae | | | | |
| <i>Prosimulium tomosvaryi</i> (Enderlein, 1921) | | • | | |
| <i>Simulium</i> (<i>Eusimulium</i>) <i>angustipes</i> Edwards, 1915 | | • | • | |
| <i>Simulium</i> (<i>Eusimulium</i>) <i>rubzovianum</i> (Sherban, 1961) | | • | • | |
| <i>Simulium</i> (<i>Nevermannia</i>) <i>angustitarse</i> (Lundström, 1911) | | • | | |
| <i>Simulium</i> (<i>Nevermannia</i>) <i>costatum</i> Friederichs, 1920 | • | • | • | |
| <i>Simulium</i> (<i>Simulium</i>) <i>monticola</i> Friederichs, 1920 | | • | • | |
| <i>Simulium</i> (<i>Simulium</i>) <i>ornatum</i> Meigen, 1818 complex | | • | • | |
| <i>Simulium</i> (<i>Simulium</i>) <i>trifasciatum</i> Curtis, 1839 | | | • | |
| <i>Simulium</i> (<i>Simulium</i>) <i>tuberosum</i> (Lundström, 1911) | | • | • | |
| <i>Simulium</i> (<i>Simulium</i>) <i>variegatum</i> Meigen, 1818 | | • | • | |
| <i>Simulium</i> (<i>Trichodagmia</i>) <i>auricoma</i> Meigen, 1818 | | • | • | |
| <i>Simulium</i> (<i>Wilhelmia</i>) <i>pseudequinum</i> Séguy, 1921 | | | • | |
| Stratiomyidae | | | | |
| <i>Oxycera pardalina</i> Meigen, 1822 | • | • | • | |
| <i>Oxycera limbata</i> Loew, 1862 | | • | • | |
| <i>Oxycera turcica</i> Ustuner & Hasbenli, 2004 | | • | | |
| <i>Nemotelus pantherinus</i> (Linnaeus, 1758) | | • | | |
| <i>Oplodontha viridula</i> (Fabricius, 1775) | | | • | |

| Species/Habitat type | Spring | Stream | Tufa barrier | Lake |
|--|-----------|-----------|--------------|-----------|
| Tabanidae | | | | |
| <i>Chrysops caecutiens</i> (Linnaeus, 1758) | | • | | |
| <i>Chrysops viduatus</i> (Fabricius, 1794) | | • | | |
| Tipulidae | | | | |
| <i>Tipula (Savtshenkia) rufina rufina</i> Meigen, 1818 | • | | | |
| Number of taxa | 75 | 71 | 53 | 38 |

In Kostić-Brnek and Brnek-Kostić (1971), the authors did not clearly state whether their identifications of *Endochironomus* cf. *dispar* and *Macropelopia* cf. *fehlmanni* were based on adults or larvae. If the identifications were made based on adults, then these reports can be considered valid. On the other hand, if larvae were identified then these reports are doubtful records since these species cannot be identified based on larval morphology alone. The species listed in the formal species list as *Eukiefferiella ilkleyensis* (Edwards, 1929) is mentioned as *Plectrocladius eukiefferiella quadridentata* Chernovskij, 1949 in Matonićkin (1987). This could be a typing error since a genus *Plectrocladius* does not exist within the family Chironomidae. On the other hand, *Eukiefferiella quadridentata* Chernovskij, 1949 is a synonym pro parte of *E. ilkleyensis* (Moller Pillot 2013). If this is not a typing error, then this species name is an unidentifiable error.

Families following Chironomidae by number of species are Empididae, Limoniidae, Simuliidae and Muscidae (only aquatic species identified) with 22, 19, 12 and 10 species, respectively (Table 2, Figure 8). Dixidae and Psychodidae are both present with nine species, while Stratiomyidae, Pediciidae and Tabanidae are present with 5, 4 and 2 species, respectively (Table 2, Figure 8). Families with only one recorded species are Athericidae, Scathophagidae and Tipulidae (Table 2, Figure 8).

The families Dixidae, Empididae and Simuliidae have been dealt with in detail in previous publications (Ivković et al. 2010, 2012a, b, 2016; Ivanković et al. 2019; Ivković and Ivanković 2019) so the numbers presented here might be the final species numbers for Plitvice Lakes NP. For these particular families, only a few additional species might be recorded in the future studies. Other families of aquatic Diptera have been studied sporadically and, in many cases, only a few sites have been completely processed, such as Chironomidae in Kostić-Brnek and Brnek-Kostić (1971) and Ivković et al. (2015). Aquatic Diptera families that are present in the Plitvice Lakes NP but are still unidentified to the species level are Ceratopogonidae, Culicidae, Ephydriidae, Sciomyzidae and Syrphidae.

Springs and streams have higher numbers of species recorded than tufa barriers and lakes (Table 2). One of the reasons for this is because the springs were studied in greater detail than other sites, especially when it comes to Chironomidae (Ivković et al. 2015). On the other hand, many aquatic Diptera families have in fact a higher diversity at spring habitats and the upper reaches of streams, such as Empididae, Psychodidae, Limoniidae, etc., because most environmental parameters at those sites remain constant (Ivković et al. 2010, 2012a, 2015; Kvifte et al. 2013; Kolcsár et al. 2015).

The species list of aquatic Diptera of Plitvice Lakes NP is still not complete since many families are either dealt with partially or not at all due to the lack of available

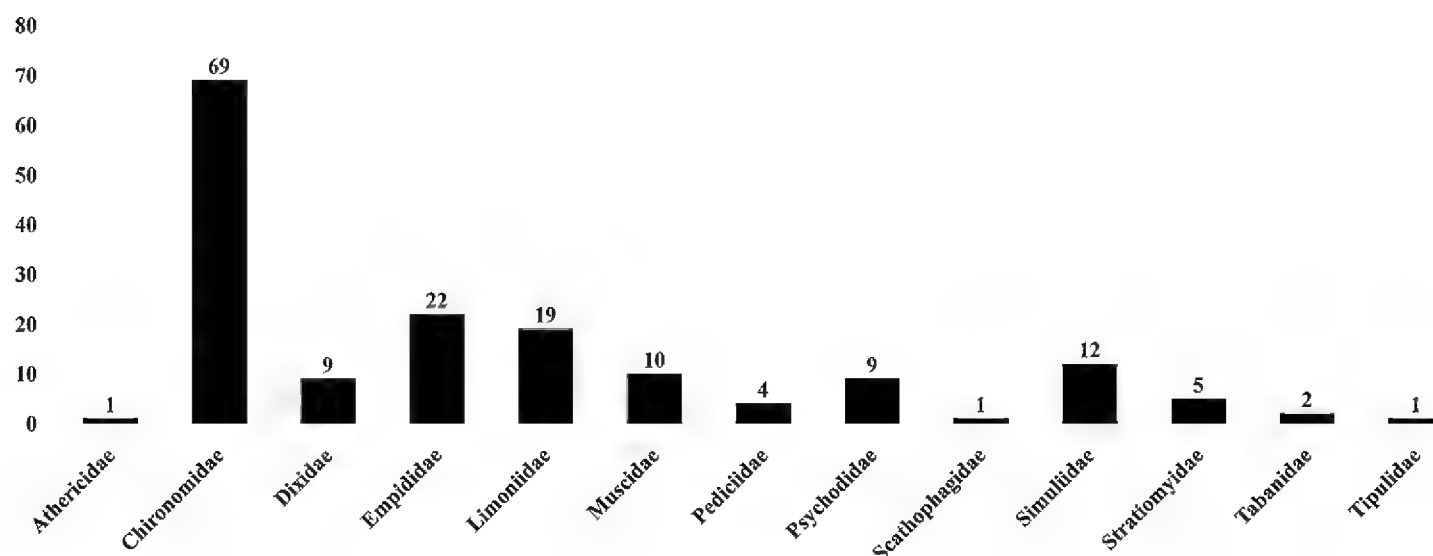


Figure 8. Species richness of Diptera families in Plitvice Lakes National Park.

experts. There is still a lot of work in front of us since we believe that about 250 species of aquatic Diptera can be expected in the unique karstic area of Plitvice Lakes NP.

Acknowledgements

We would like to thank Miljenko Ivković, Dr Marko Miliša, Dr Ivana Pozojević, and many students for their tremendous help with the fieldwork. We would like to thank Dr Andrey Ozerov for help with Scathophagidae identification.

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